



PATENT
Attorney Docket No. 212865

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Kurita et al.

Art Unit: Unassigned

Application No. 09/921,358

Examiner: Unassigned

Filed: August 2, 2001

For: FLEXIBLE METAL-CLAD LAMINATE AND
PROCESS FOR PREPARING THE SAME

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Prior to the examination of the above-identified patent application, please enter the following amendments and consider the following remarks.

AMENDMENTS

IN THE SPECIFICATION:

Replace the paragraph beginning at page 17, line 10 with:

In the preparation of aromatic polyimide and aromatic polyamide-imide for use in the present invention, other substances may be used insofar as heat resistance and coefficient of thermal expansion are not deteriorated. Such other substances include acid components such as adipic acid, azelaic acid, sebacic acid, cyclohexane-4,4'-dicarboxylic acid, butane-1,2,4-tricarboxylic acid, butane-1,2,3,4-tetracarboxylic acid, cyclopentane-1,2,3,4-tetracarboxylic acid and like aliphatic and alicyclic dicarboxylic acids, polycarboxylic acids and monoanhydrides, dianhydrides and esterified compounds of these substances; amine components such as tetramethylenediamine, hexamethylenediamine, isophorone diamine, 4,4'-dicyclohexylmethanediamine, cyclohexane-1,4-diamine, diaminosiloxane and like aliphatic and alicyclic diamines and diisocyanates corresponding to these substances. The aliphatic and alicyclic diamines and diisocyanates may be used singly or as mixtures of two

or more species. Resins prepared by combining and polymerizing any of these acid components and amine components may also be used as blended.

Replace the paragraph beginning at page 31, line 22 with:

The flexible metal-clad laminate of the present invention is characterized in that it is produced by laminating (e.g., by applying a solution containing an organic solvent and a condensation polymer to a metal foil and drying the laminate) the metal foil 11 and the heat-resistant resin film 31 comprising an organic solvent-soluble condensation polymer and formed on one side of the metal foil. The flexible metal-clad laminate is also characterized in that the heat-resistant resin film 31 contains the above crosslinked condensation polymer and that the heat-resistant resin film has an N-methyl-2-pyrrolidone-insoluble content of at least 1% after being laminated.

IN THE CLAIMS:

6. (Amended) The flexible metal-clad laminate according to claim 1, wherein the average surface roughness Ra of the surface of the heat-resistant resin film layer which is in contact with the metal foil is not more than 0.4 μm .

17. (Amended) A flexible metal-clad laminate which is produced by the method according to claim 9.

18. (Amended) A flexible printed wiring board which is obtainable from the flexible metal-clad laminate according to claim 1.

REMARKS

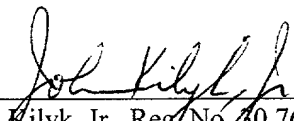
The specification has been amended to remove inadvertent typographical errors in the translated specification based on the Japanese priority document.

In re Appln. of Kurita et al.
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The claims have been amended to remove multiple dependencies and to place the claims in a format more consistent with U.S. patent practice. No substantive amendments have been made to the claims, and the scope of the claims was not altered. Accordingly, no new matter has been added by way of these claim amendments.

The application is considered in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,



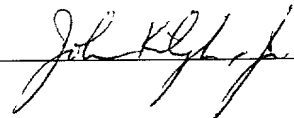
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Date: November 8, 2001

CERTIFICATE OF MAILING

I hereby certify that this PRELIMINARY AMENDMENT (along with any documents referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231.

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PENDING CLAIMS AFTER ENTRY OF PRELIMINARY AMENDMENT

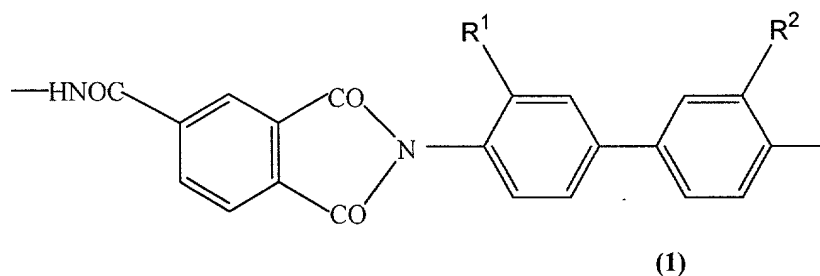
1. A flexible metal-clad laminate comprising a metal foil and a heat-resistant resin film layer formed on one side of the metal foil, the heat-resistant resin film layer comprising a crosslinked condensation polymer and having an N-methyl-2-pyrrolidone-insoluble content of at least 1%, particularly 1 to 99%.
2. The flexible metal-clad laminate according to claim 1, wherein the heat resistant resin film layer is formed by converting an organic solvent-soluble condensation polymer by crosslinking into an organic solvent-insoluble form.
3. The flexible metal-clad laminate according to claim 1, wherein the heat-resistant resin film layer is formed by applying to the metal foil a solution prepared by dissolving an organic solvent-soluble condensation polymer in the organic solvent and subjecting the coated metal foil to a predrying step, and a heat-treatment and solvent removal step.
4. The flexible metal-clad laminate according to claim 1, wherein the heat-resistant resin film layer has an initiation tear strength (film thickness: 20 μ m) of at least 15 kg and has a thermal gradient dimensional change of not more than 0.1% when heated at 200°C for 30 minutes.

5. The flexible metal-clad laminate according to claim 1, which has a solder heat resistance of at least 350°C, an adhesion between the metal foil and the heat-resistant resin film of at least 80 g/mm and a radius of curvature of at least 15 cm.

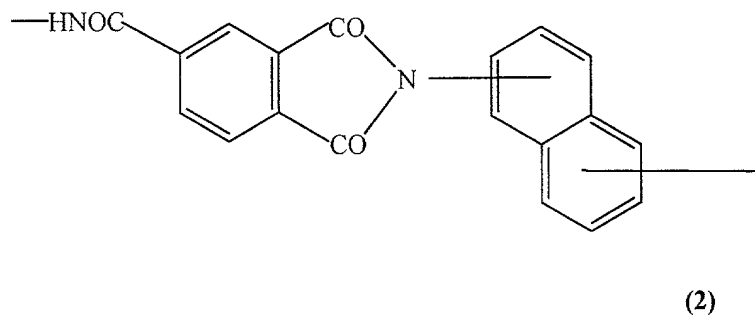
6. The flexible metal-clad laminate according to claim 1, wherein the average surface roughness Ra of the surface of the heat-resistant resin film layer which is in contact with the metal foil is not more than 0.4 μm .

7. The flexible metal-clad laminate according to claim 1, wherein the elastic modulus retentivity of the heat-resistant resin film after being immersed in an aqueous solution of sodium hydroxide (40% by weight) at 25°C for 100 hours is at least 40%.

8. The flexible metal-clad laminate according to claim 1, wherein the condensation polymer comprises the unit represented by formula (1)



wherein R¹ and R² are the same or different and each represents hydrogen or an alkyl or alkoxy group having 1 to 4 carbons atoms and/or the unit represented by formula (2)



9. A method for producing the flexible metal-clad laminate as set forth in claim 1, the method comprising the steps of

(A) applying to the metal foil a solution prepared by dissolving a heat-resistant resin containing an organic solvent-soluble condensation polymer in the organic solvent, predrying the resulting coating film until the coating has a residual solvent content of 10 to 40% by weight to obtain a predried laminate comprising the predried heat-resistant resin layer and the metal foil, and

(C) heat-treating the above predried laminate.

10. The method according to claim 9, which further comprises step (B) of winding up, in the form of a roll, the predried laminate obtained in step (A) in such a manner that its coated surface does not come into contact with its uncoated surface.

11. The method according to claim 9, wherein the predrying in step (A) is carried out at a temperature 70°C to 130°C lower than the boiling point of the solvent used for preparing the heat-resistant resin solution.

12. The method according to claim 9, wherein the heat-treating in step (C) is carried out under reduced pressure and/or in an inert gas atmosphere, while removing the solvent such that the heat-resistant resin layer has an insoluble content of 1% to 99%.

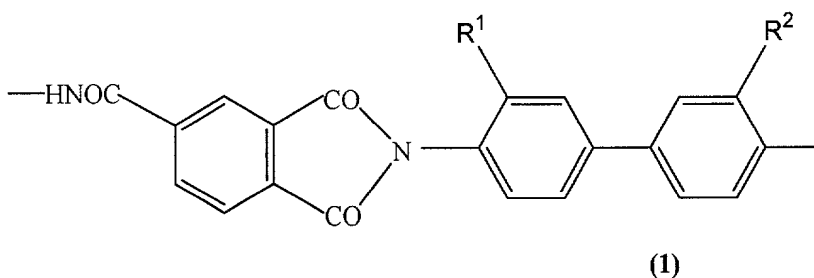
13. The method according to claim 9, wherein in step (C), the predried laminate is dried under reduced pressure at 200 to 400°C to reduce the residual solvent content to 5% by weight or lower and then heating the laminate in an inert gas at 200 to 400°C for 1 to 30 hours.

14. The method according to claim 10, wherein step (A) comprises applying the heat-resistant resin solution to the metal foil to leave the lengthwise borders on either edge uncoated, predrying the applied resin solution to obtain a predried laminate comprising the predried heat-resistant resin layer and the metal foil and step (B) comprises placing a tape made of a material different from that of the laminate on the uncoated portions of the predried

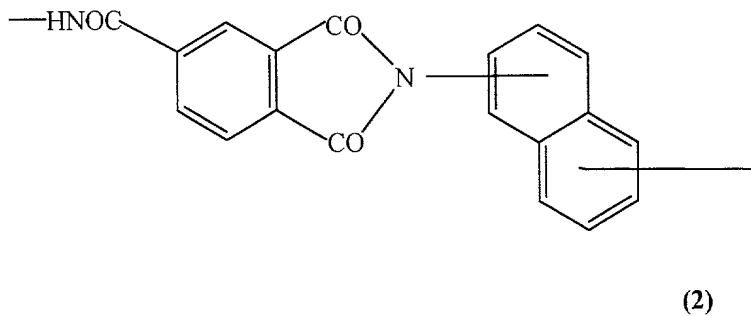
laminate or covering both lengthwise edges of the predried laminate with the tape, when winding up the metal foil.

15. The method according to claim 9, wherein the heat-resistant resin is an organic solvent-soluble polyimide and/or polyamide-imide.

16. The method according to claim 9, wherein the heat-resistant resin comprises the unit represented by formula (1)



wherein R¹ and R² are the same or different and each represents hydrogen or an alkyl or alkoxy group having 1 to 4 carbon atoms and/or the unit represented by formula (2)



17. A flexible metal-clad laminate which is produced by the method according to claim 9.

18. A flexible printed wiring board which is obtainable from the flexible metal-clad laminate according to claim 1.



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**AMENDMENTS TO SPECIFICATION AND CLAIMS
MADE VIA PRELIMINARY AMENDMENT**

*(Deletions to the specification are indicated by brackets,
while additions are indicated by underlined text)*

IN THE SPECIFICATION:

Amendments to the paragraph beginning at page 17, line 10:

In the preparation of aromatic polyimide and aromatic polyamide-imide for use in the present invention, other substances may be used insofar as heat resistance and coefficient of thermal expansion are not deteriorated. Such other substances include acid components such as adipic acid, azelaic acid, sebacic acid, [cyclohexane-4,4,'-dicarboxylic] cyclohexane-4,4'-dicarboxylic acid, butane-1,2,4-tricarboxylic acid, butane-1,2,3,4-tetracarboxylic acid, cyclopentane-1,2,3,4-tetracarboxylic acid and like aliphatic and alicyclic dicarboxylic acids, polycarboxylic acids and monoanhydrides, dianhydrides and esterified compounds of these substances; amine components such as tetramethylenediamine, hexamethylenediamine, isophorone diamine, 4,4'-dicyclohexylmethanediamine, cyclohexane-1,4-diamine, diaminosiloxane and like aliphatic and alicyclic diamines and diisocyanates corresponding to these substances. The aliphatic and alicyclic diamines and diisocyanates may be used singly or as mixtures of two or more species. Resins prepared by combining and polymerizing any of these acid components and amine components may also be used as blended.

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IN THE CLAIMS:

6. (Amended) The flexible metal-clad laminate according to claim 1, wherein the average surface roughness Ra of the surface of the heat-resistant resin film layer which is in contact with the metal foil is not more than 0.4 μm .

17. (Amended) A flexible metal-clad laminate which is produced by the method according to [any one of claims] claim 9 [to 16].

18. (Amended) A flexible printed wiring board which is obtainable from the flexible metal-clad laminate according to [any one of claims] claim 1 [to 8].



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RESPONSE TO NOTICE TO FILE MISSING PARTS

Commissioner for Patents
Washington, D.C. 20231

Dear Sir

Applicants hereby respond to the Notice to File Missing Parts of Application dated September 10, 2001.

The items checked below are appropriate:

1. Status of Applicant

This application is on behalf of ☒ other than a small entity or ☐ a small entity.

2. Documents Submitted Herewith

- a. ☐ Executed Declaration of inventor(s)
- b. ☐ Nucleotide and/or Amino Acid Sequence Submission:
 - i. ☐ Computer Readable Form (CRF)
 - ii. Specification Sequence Listing on:
 - (1) ☐ CD-ROM or CD-R (2 copies); or
 - (2) ☐ Paper Copy
 - iii. ☐ Statement verifying identity of above copies
- c. ☒ Verified English translation of application
- d. ☒ Copy of the Notice to File Missing Parts of Application.
- e. ☐ Substitute Drawings
- f. ☒ Other: Preliminary Amendment

CERTIFICATE OF MAILING

I hereby certify that this document (along with any documents referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231.

Date: November 8, 2001

3. Fees

Application Filing Fee

APPLICATION FEES				
BASIC FEE				\$ 740.00 (prepaid)
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total Claims	18 - 20 =	0	x \$18.00	\$ 0.00
Independent Claims	1 - 3 =	0	x \$84.00	\$ 0.00
<input type="checkbox"/> Multiple Dependent Claims(s) if applicable			+\$280.00	\$ 0.00
Total of above calculations =				\$ 0.00
Reduction by 50% for filing by small entity =				\$(0.00)
Fee Due =				\$0.00

Late Filing of Oath or Declaration

Pursuant to 37 CFR 1.16(e), the surcharge for filing this Response is for ☐ other than a small entity or ☐ a small entity.

Fee Due \$ 0.00

Submitting a Translation of the Specification

Pursuant to 37 CFR 1.17(i), the surcharge for submitting an English translation of the non-English specification is included.

Fee Due \$130.00

Extension of Time

☐ Applicants petition for a one-month extension of time under 37 CFR 1.136, the fee for which is \$110.00.

☒ Applicants believe that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicants have inadvertently overlooked the need for a petition and fee for extension of time.

Fee Due \$0.00

4. **Total Fee Due**

The total fee due is:

Application Filing Fee	\$ 0.00
Late Filing of Declaration Surcharge	\$ 0.00
Non-English Specification Surcharge	\$ 130.00
Extension of Time Fee	\$ 0.00

Total Fee Due: \$130.00

In re Appln. of Kurita et al.
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5. Fee Payment

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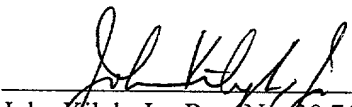
Attached is a check in the sum of \$130.00.

Charge Account No. 12-1216 the sum of \$. A duplicate of this transmittal is attached.

6. Fee Deficiency

☒

If any additional fee is required in connection with this communication, charge Account No. 12-1216. A duplicate of this transmittal is attached.



John Kilyk, Jr., Reg. No. 30,763
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Date: November 8, 2001